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(54) PRESENSITIZED PRINTING PLATE WITH IN-SITU, LASER IMAGABLE MASK

(71) We, SCOTT PAPER COMPANY, a Corporation organised and existing under the laws of the State of Pennsylvania, United States of America, of Industrial Highway at Tinicum Island Road, Delaware County, State of Pennsylvania, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to planographic printing plates and more particularly, to plates having a mask layer capable of being selectively removed by a laser beam to form the pattern desired to be printed.

Lithographic printing, frequently referred to as offset printing, occupies a substantial segment of the printing plate market, primarily because it is an economical method for producing a large number of copies. Most lithographic plates today are of the presensitized type. Such plates are provided with a photosensitive coating which permits the formation of an image on the plate by exposure through a master transparency and subsequent development.

It has recently been proposed, see United States Patent 3,664,737 granted May 23, 1972 for "Printing Plate Recording by Direct Exposure" (Lipp), to directly record information on a printing plate by means of a laser beam having a wave length in the actinic (UV) region. There are two major advantages of imaging by a laser beam. The first is that it permits the elimination of the master transparency. The images can be either computer generated or can be provided by scanning a paste-up or other original by appropriate photoelectronic means which in turn modulates the laser beam. The second advantage is that the signal, however generated, for modulating the laser which writes the image on the plate can be transmitted over great distances to a multiplicity of writing lasers. This obviously would be of particular significance to newspaper and magazine publishers who operate a number of regional printing facilities.

While the laser is a promising tool for the production of planographic printing plates and the proposal to directly image a presensitized lithographic printing plate with a laser beam having a wave length in the actinic (UV) region has great appeal, the proposal is not commercially practical for the reason that such lasers are extremely expensive, are not generally commercially available and, to date, their power output has been low. There are, on the other hand, non-UV lasers available which are relatively inexpensive and which have a useful power output.

In accordance with the present invention a presensitized planographic printing plate, having a layer of material which is sensitive to ultaviolet light, is provided with a coating which is opaque to ultraviolet light and is capable of being removed or rendered transparent to ultraviolet light by non-UV laser radiation. A mask or template is formed on the presensitized plate by selectively removing the layer which is opaque to ultraviolet light by means of an appropriate laser beam. The beam of radiant energy is applied to the opaque layer to vaporize and remove it in selected areas so that the remaining areas of the opaque layer define the areas which are to be exposed to ultraviolet.

The presensitized printing plate underlying the mask layer can be any one of the commercially available types of either positive working or negative working lithographic printing plates or it can be a dry planographic printing plate such as disclosed in United States Patent 3,606,922, Doggett, granted September 21, 1971. The construction or composition of the presensitized printing plate portion of the plate of the present invention is not critical for the reason that once the mask is formed in situ and the plate is exposed to ultraviolet light, development of the plate proceeds in a conventional manner.

The layer of material which is opaque

to ultraviolet light and capable of being removed or rendered transparent to ultraviolet light by non-UV laser radiation can be a metal layer or a dispersion of metal or carbon particles in an organic binder. Suitable metals include aluminium, copper and zinc. The metal film must be thick enough to be opaque to ultraviolet and it will normally be made as thin as practical in order for it to be vaporized and removed rapidly with a minimum amount of radiant energy applied by the laser for this purpose. By way of example, a zinc film on the order of one micro-inch in thickness satisfies the criteria. A suitable method for forming films of metal at such thickness is vacuum deposition. The layer of metal can be applied directly to the photosensitive surface of the presensitized printing plate but may also advantageously be applied to a thin film of a plastic such as a polyester which is then applied to the presensitized printing plate surface.

As indicated by United States Patent 3,650,796 granted March 21, 1972 for "Photolithographic Masks", selection of an appropriate laser for removing the layer of material which is opaque to ultraviolet light is well within the skill of the ordinary worker in the art to which the present invention pertains. Means for modulating a laser beam to record information on a substrate are also well known in the art and need not be discussed here. In general they can be characterized as scanning mechanisms which cause the beam to traverse the area, delivering energy in a predetermined manner. Suitable apparatus is disclosed in United States Patent 3,739,088 granted June 12, 1973.

In the following examples a negative working diazo composition, the reaction product of p-diazodiphenylamine formaldehyde condensation product and sodium lauryl sulfate was employed. The laser employed was a YAG(yttrium aluminium garnet) laser.

Example I
Illustrating the use of an aluminium mask

Plate: An anodized and silicated 8 mil aluminium base coated with the identified ultraviolet (UV) sensitive coating by #10 mayer rod in an amount of 0.8 lbs./ream;

Over this dried coating was deposited from vapor in vacuum a 300 angstrom aluminium layer (mask).

Processing: This mask was removed in selected areas by writing with a laser;

The entire plate was exposed for 60 seconds to a carbon arc whereby no longer masked UV sensitive areas were photopolymerized;

The remaining mask was removed using a 2% aqueous potassium hydroxide solution;

The unexposed UV sensitive layer was then removed by the application of a subtractive developer.

Example II
Illustrating the use of a copper mask

Plate: A 12 mil substrate that was a paper-aluminium foil laminate was coated on its paper surface with a PVA composition to render it hydrophilic. To this substrate was applied the ultraviolet (UV) sensitive coating by #10 mayer rod in an amount of about 0.1 lbs./ream;

Finally over this dried coating was deposited a 50 angstrom copper layer deposited from vapor in vacuum.

Processing: The plate was processed according to Example I with the exception that the UV sensitive layer was exposed to the carbon arc for 30 seconds.

On development a faint image was obtained.

Example III
Illustrating the use of a laminate mask

Plate: To the ultraviolet (UV) sensitive coated base of Example I was adhered a mask which consisted of a vacuum deposited zinc layer on a polycarbonate film (film side adhered to base by an adhesive).

Processing: This plate was laser scanned and then overall exposed to UV light for 45 seconds. Following this, the film was separated from the plate and the plate was subsequently developed with subtractive developer.

Example IV
Illustrating the use of a pigmented mask

Plate: The aluminium base with the ultraviolet sensitive coating of Example I was coated with the following mask composition:

	Parts by weight dry
Carbon black	30.2
Nitrocellulose	30.2
Aluminium powder	10.4
Phenolic resin	29.2

50/50 (by volume) mixture of xylene and ethyl "Cellosolve" (Registered Trade Mark) was added to adjust the solids content to 6.9% by weight.

The mask layer was applied at a weight of 0.7 lbs./ream.

Processing: The plate was processed according to Example III. When mounted on an offset duplicating press the plate provided good quality prints.

Example V
Illustrating the use of a pigmented mask

Plate: The aluminium base with the ultra-

violet sensitive coating of Example I was coated with the following mask composition:

	Parts by weight dry
Carbon black	25
Nitrocellulose	17.5
Alkyd resin	57.5

Methyl ethyl ketone was added to adjust the solids content to 8% by weight. The coating was applied by #10 mayer rod in an amount of 1.0 lbs./ream.

Processing: The plate was processed according to the previous examples with the exception that the UV sensitive layer was exposed to the carbon arc for 2 minutes.

WHAT WE CLAIM IS:—

1. A planographic printing plate comprising a layer of material which is sensitive to ultraviolet light and overlying said layer, a second layer which is opaque to ultraviolet light and capable of being removed or rendered transparent to ultraviolet light by non-UV laser radiation.

2. A plate according to claim 1, wherein the material which is sensitive to ultraviolet light is rendered insoluble and ink receptive upon exposure to ultraviolet light.

3. A plate according to claim 1, wherein the material which is sensitive to ultraviolet light is decomposed by ultraviolet light.

4. A plate according to any one of the preceding claims, wherein the layer which is opaque to ultraviolet light is a metal layer.

5. A plate according to claim 4, wherein the metal is aluminium, copper or zinc.

6. A plate according to any one of the preceding claims 1 to 3, wherein the layer which is opaque to ultraviolet light comprises a dispersion of carbon particles in an organic binder.

7. A plate according to claim 6, wherein the layer further includes powdered metal.

8. A plate according to claim 6 or 7, wherein the binder is nitrocellulose.

9. A planographic printing plate according to claim 1, substantially as hereinbefore described with reference to the Examples.

10. A method of imaging a planographic printing plate which comprises a layer of material which is sensitive to ultraviolet light and overlying said layer, a second layer which is opaque to ultraviolet light and capable of being removed or tendered transparent to ultraviolet light by non-UV laser radiation, said method comprises the steps of selectively removing or rendering transparent to ultraviolet light by means of non-UV laser radiation areas of the layer which is opaque to ultraviolet light, exposing said plate overall to ultraviolet light, removing the remaining portions of the layer which is opaque to ultraviolet light and developing said plate.

11. A method according to claim 10 of imaging a planographic printing plate, substantially as hereinbefore described with reference to the Examples.

12. Planographic printing plates, whenever made by the method of claim 10 or 11.

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